EFRON, K.M. (Moskva)

Conservation of natural resources in the center of public attention. Priroda 52 no.3:110-111 '63. (MIRA 16:4)
(Conservation of natural resources--Congresses)

PUTINA, M.Kh., inzh.; STAL'SKIY, V.V., inzh.; EFROS, A.A., inzh.

Remote control of electric relays. Elek. sta. 33 no.5:85-87 My '62. (MIRA 15:7)

(Electric relays)
(Electric power distribution)

84439

S/057/60/030/009/003/021
B019/B054

9.3100 (1031,1144,1159)

AUTHOR: Efros, A. L.

TITLE: Potential Distribution Under a Cylindrical Probe

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1960, Vol. 30, No. 9, pp. 1024-1029

TEXT: The first part of the present paper deals with the problem as such and with its solution. The boundary problem of the potential theory is considered in a region consisting of a semispace ($z < 0$) and the interior of a cylinder with radius r_o. Cylinder and semispace touch (Fig. 1). The author's considerations show that the problem of potential distribution under a cylindrical probe is a boundary problem of the second type with homogeneous conditions at the outer boundaries. Homogeneity of the field is also demanded in the infinity of the semispace. The author assumes the following solution within the cylinder:

$U_I = \sum_{n=1}^{\infty} d_n J_1(q_n r/r_o)\exp(-q_n z/r_o)\cos\varphi$ (6). Here, the q_n are the kernels

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of the derived first Bessel function. The following solution is formulated for the semispace:

$$U_{II} = \left[AP_1^1(\xi)P_1^1(j\xi) + \sum_{n=0}^{N} B_{2n+1}P_{2n+1}^1(\xi)Q_{2n+1}^1(j\xi)\right]\cdot\cos\varphi \quad (7).$$

In the second part of the paper, the author deals with the calculation of solutions in first approximation, and in the third part, in second approximation. The results are compiled in Tables 1 and 2. It can be seen that the calculation in first approximation is sufficient unless a particularly high accuracy is demanded. There are 1 figure, 2 tables, and 2 Soviet references.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors of the AS USSR, Leningrad)

SUBMITTED: November 17, 1959

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20143

24.7100 1035 1043 1158 also 1103

S/181/61/003/002/041/050
B102/B201

AUTHORS: Oskotskiy, V. S. and Efros, A. L.

TITLE: Theory of the crystal lattice with peripheral interatomic interactions

PERIODICAL: Fizika tverdogo tela, v. 3, no. 2, 1961, 611-624

TEXT: This is an extensive theoretical work dealing with problems of the correspondence of the microscopic lattice theory and the elasticity theory. A most general expression is derived in harmonic approximation for the lattice energy density at a given field of displacement of the atoms from their position of equilibrium, describing peripheral interaction. The method of the homogeneous static deformation is then applied to express the elastic constants as functions of the parameters of the microscopic theory, and a condition is derived for the elimination of all components of the initial stress. It is shown that in the absence of initial stresses the elastic constants calculated by the method of homogeneous static deformation coincide with those calculated by the "method

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Theory of the crystal lattice ...

of the "long wave" (Huang Kun) (in the presence of initial stresses the elastic constants cannot be calculated by the method of the long wave). A relation is found between the parameters determining the energy density and the dynamic matrices. It is shown by the example of simple cubic lattices, that the condition of the absence of all components of initial stresses leads, if only the closest neighbors undergo interaction, to a restriction of the form of dynamic matrices, that cannot be obtained from Born's theory. The paper consists of seven chapters. The problem is first outlined briefly, the method of the long waves and the applicability of the harmonic approximation being discussed next. In the said approximation the lattice energy is given by

$$U=\frac{1}{2}\sum_{lkl'k'}\sum_{\alpha\beta}\Phi_{\alpha\beta}\binom{l-l'}{kk'}u_{\alpha}\binom{l}{k}u_{\beta}\binom{l'}{k'}, \qquad (1)$$

where $\Phi_{\alpha\beta}$ (..) denotes the component of the dynamic matrix, $u_{\alpha}\binom{l}{k}$ the component of the displacement vector, l the number of the cell, k is the number of the atom in the cell. On a dislocation of the atoms from the

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position of equilibrium

$$v(\Omega)=\frac{1}{V_\Omega}\left\{\sum_{lk}^{\Omega}\sum_{l'k'}\sum_{\alpha}Q_\alpha\begin{pmatrix}l-l'\\kk'\end{pmatrix}u_\alpha\begin{pmatrix}ll'\\kk'\end{pmatrix}-\right.$$

$$\left.-\frac{1}{4}\sum_{lk}^{\Omega}\sum_{\substack{l'k'\\l''k''\\l'''k'''}}\sum_{\alpha\beta}Q'_{\alpha\beta}\begin{pmatrix}l-l' & l-l'' & l-l'''\\kk' & kk'' & kk'''\end{pmatrix}u_\alpha\begin{pmatrix}ll'\\kk'\end{pmatrix}u_\beta\begin{pmatrix}l''l'''\\k''k'''\end{pmatrix}\right\}, \qquad (2)$$

the general representation of the energy density in the region Ω is then transformed and

$$v(\Omega)=\frac{1}{V_\Omega}\left\{\sum_{lk}^{\Omega}\sum_{l'k'}\sum_{\alpha}Q_\alpha\begin{pmatrix}l-l'\\kk'\end{pmatrix}u_\alpha\begin{pmatrix}ll'\\kk'\end{pmatrix}+\right.$$

$$\left.+\frac{1}{2}\sum_{lk}^{\Omega}\sum_{\substack{l'k'\\l''k''}}\sum_{\alpha\beta}Q_{\alpha\beta}\begin{pmatrix}l-l' & l-l''\\kk' & kk''\end{pmatrix}u_\alpha\begin{pmatrix}ll'\\kk'\end{pmatrix}u_\beta\begin{pmatrix}ll''\\kk''\end{pmatrix}\right\}, \qquad (5)$$

$$Q_{\alpha\beta}\begin{pmatrix}l-l' & l-l''\\kk' & kk''\end{pmatrix}=\sum_{l'''k'''}Q'_{\alpha\beta}\begin{pmatrix}l-l' & l-l'' & l-l'''\\kk' & kk'' & kk'''\end{pmatrix}.$$

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is obtained; furthermore

$$F_\alpha\binom{l}{k} = -\frac{\partial U}{\partial u_\alpha\binom{l}{k}} = -2\sum_{l'k'}{}' Q_\alpha\binom{l-l'}{kk'} + \sum_{l'k'}\sum_\beta \Phi_{\alpha\beta}\binom{l-l'}{kk'} u_\beta\binom{ll'}{kk'}, \qquad (7)$$

где

$$\Phi_{\alpha\beta}\binom{l-l'}{kk'} = \sum_{l''k''}{}' \Big[Q_{\alpha\beta}\binom{l''-l \;\; l''-l'}{k''k \;\; k''k'} - Q_{\alpha\beta}\binom{l-l'' \;\; l-l'}{kk'' \;\; kk'} - Q_{\alpha\beta}\binom{l'-l \;\; l'-l''}{k'k \;\; k'k''}\Big], \qquad (8)$$

при $l \neq l'$, $k \neq k'$.

are obtained for the force acting upon the atom lk, and it is shown that if $\sum_{l'k'} Q_\alpha\binom{l-l'}{kk'} = 0$, the matrices $\Phi_{\alpha\beta}\binom{l-l'}{kk'}$ coincide with Born's dynamic matrices from formula (1). By

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$$\Delta v(\Omega)=\frac{1}{V_\Omega}\left\{\sum_{lk}{}^{\Omega}\sum_{l'k'}\sum_{\alpha s}\left[Q_\alpha\begin{pmatrix}l-l'\\ kk'\end{pmatrix}\omega_{\alpha s}R_s\begin{pmatrix}l-l'\\ kk'\end{pmatrix}+\right.\right.$$
$$\left.+Q_\alpha\begin{pmatrix}l-l'\\ kk'\end{pmatrix}\omega_{\alpha s}\overline{u_s\begin{pmatrix}ll'\\ kk'\end{pmatrix}}\right]+$$
$$\left.+\sum_{lk}{}^{\Omega}\sum_{\substack{l'k'\\ l''k''}}\sum_{\alpha\beta s}Q_{\alpha\beta}\begin{pmatrix}l-l' & l'-l''\\ kk' & kk''\end{pmatrix}\overline{u_\alpha\begin{pmatrix}ll'\\ kk'\end{pmatrix}}\omega_{\beta s}R_s\begin{pmatrix}l-l'\\ kk''\end{pmatrix}\right\}, \qquad (13)$$

где $R_s\begin{pmatrix}l-l'\\ kk'\end{pmatrix}=R_s\begin{pmatrix}l\\ k\end{pmatrix}-R_s\begin{pmatrix}l'\\ k'\end{pmatrix}$.

the conditions to be imposed to the Q matrix are obtained

$$\sum_{l'k'}\sum_{l''k''}\left[Q_{\gamma\alpha}\begin{pmatrix}l-l' & l-l''\\ kk' & kk''\end{pmatrix}R_\gamma\begin{pmatrix}l-l''\\ kk''\end{pmatrix}-\right.$$
$$\left.-Q_{\alpha\gamma}\begin{pmatrix}l-l' & l-l''\\ kk' & kk''\end{pmatrix}R_\alpha\begin{pmatrix}l-l''\\ kk''\end{pmatrix}\right]=0, \qquad (16a)$$

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$$\sum_{lk}\sum_{l''k''}\Big[Q_{sa}\begin{pmatrix} l-l' & l-l'' \\ kk' & kk''\end{pmatrix}R_q\begin{pmatrix} l-l'' \\ kk''\end{pmatrix}- - Q_{sq}\begin{pmatrix} l-l' & l-l'' \\ kk' & kk''\end{pmatrix}R_a\begin{pmatrix} l-l'' \\ kk''\end{pmatrix}\Big]=0.$$

$$\sum_{l'k'}\Phi_{a\beta}\begin{pmatrix} l-l' \\ kk'\end{pmatrix}R_\gamma\begin{pmatrix} l-l' \\ kk'\end{pmatrix}=\sum_{l'k'}\Phi_{a\gamma}\begin{pmatrix} l-l' \\ kk'\end{pmatrix}R_\beta\begin{pmatrix} l-l' \\ kk'\end{pmatrix}. \qquad (16б)$$

Кроме того, из (15) следуют соотношения (17)

$$\sum_{l''k''}\Big[Q_{sa}\begin{pmatrix} l-l' & l-l'' \\ kk' & kk''\end{pmatrix}R_q\begin{pmatrix} l-l'' \\ kk''\end{pmatrix}-Q_{sq}\begin{pmatrix} l-l' & l-l'' \\ kk' & kk''\end{pmatrix}R_a\begin{pmatrix} l-l'' \\ kk''\end{pmatrix}\Big]=0, \qquad (18)$$

при $s\neq a$, $s\neq q$;

$$\sum_{l''k''}\Big[Q_{ss}\begin{pmatrix} l-l' & l-l'' \\ kk' & kk''\end{pmatrix}R_a\begin{pmatrix} l-l'' \\ kk''\end{pmatrix}-Q_{sa}\begin{pmatrix} l-l' & l-l'' \\ kk' & kk''\end{pmatrix}R_s\begin{pmatrix} l-l'' \\ kk''\end{pmatrix}\Big]=$$

$$=\sum_{l''k''}\Big[Q_{qq}\begin{pmatrix} l-l' & l-l'' \\ kk' & kk''\end{pmatrix}R_a\begin{pmatrix} l-l'' \\ kk''\end{pmatrix}-Q_{qa}\begin{pmatrix} l-l' & l-l'' \\ kk' & kk''\end{pmatrix}R_q\begin{pmatrix} l-l'' \\ \end{pmatrix}\Big]$$

The determination of the elastic moduli of the crystal is then discussed by the method of the homogeneous static deformation, where the dislocation is expressed in the form

$$u_\alpha\binom{l}{k} = \sum_\gamma \frac{\partial u_\alpha}{\partial x_\gamma} R_\gamma\binom{l}{k} + u_\alpha(k);$$

here, the last term is the displacement component of the sublattice as a whole, consisting of k atoms, $\partial u_\alpha/\partial x_\gamma$ the unsymmetrical deformation tensor.

$$v = \frac{1}{v_a}\Bigg\{\sum_{l'kk'}\sum_{\alpha\gamma} Q_\alpha\binom{l-l'}{kk'}\left[R_\gamma\binom{l-l'}{kk'}\frac{\partial u_\alpha}{\partial x_\gamma} + u_\alpha(k) - u_\alpha(k')\right] +$$
$$+\frac{1}{2}\sum_{l'kk'}\sum_{l''k''}\sum_{\alpha\beta\gamma\delta} Q_{\alpha\beta}\begin{pmatrix} l-l' & l-l'' \\ kk' & kk'' \end{pmatrix}\left[R_\gamma\binom{l-l'}{kk'}\frac{\partial u_\alpha}{\partial x_\gamma} + u_\alpha(k) - u_\alpha(k')\right] \times$$
$$\times\left[R_\delta\binom{l-l''}{kk''}\frac{\partial u_\beta}{\partial x_\delta} + u_\beta(k) - u_\beta(k'')\right]\Bigg\}. \qquad (23)$$

holds, from which, eventually, using

$$\frac{\partial v}{\partial u_\alpha(k)} = -\sum_{l'k'}\sum_{\alpha\beta}\left\{\sum_\gamma \Phi_{\alpha\beta}\binom{l'}{kk'} R_\gamma\binom{l'}{kk'}\frac{\partial u_\beta}{\partial x_\gamma} + \Phi_{\alpha\beta}\binom{l'}{kk'} u_\beta(k')\right\} = 0. \qquad (26)$$

and

$$u_\alpha(k) = \sum_{lk'k''}\sum_{\delta\rho\mu}\Gamma_{\alpha\delta}(kk')\,\Phi_{\delta\rho}\binom{l}{k'k''} R_\mu\binom{l}{k'k''}\frac{\partial u_\rho}{\partial x_\mu}, \qquad (27)$$

$$v=\frac{1}{v_a}\sum_{lkk'}\sum_{\alpha\gamma}Q_\alpha\binom{l}{kk'}R_\gamma\binom{l}{kk'}\frac{\partial u_\alpha}{\partial x_\gamma}+\frac{1}{2}\sum_{\alpha\gamma\beta\delta}(\alpha\gamma,\ \beta\delta)\frac{\partial u_\alpha}{\partial x_\gamma}\frac{\partial u_\beta}{\partial x_\delta}+$$
$$+\sum_{\alpha\gamma\beta\delta}(\alpha\gamma,\ \beta\delta)\frac{\partial u_\alpha}{\partial x_\gamma}\frac{\partial u_\beta}{\partial x_\delta}. \qquad (28)$$

is obtained. After a comparison of results obtained by the method of the static deformation and by the method of long waves, the case of the central interaction is examined. Here one obtains by

$$v(\Omega)=\frac{1}{V_\Omega}\sum_{lk}{}_{\Omega}\sum_{l'k'}\sum_{\alpha}\left\{Q_\alpha\binom{l-l'}{kk'}u_\alpha\binom{ll'}{kk'}+\right.$$
$$\left.+\frac{1}{2}\sum_{\beta}Q_{\alpha\beta}\begin{pmatrix}l-l' & l-l'\\ kk' & kk'\end{pmatrix}u_\alpha\binom{ll'}{kk'}u_\beta\binom{ll'}{kk'}\right\}. \qquad (45)$$

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$$\Phi_{\alpha\beta}\binom{l-l'}{kk'}=\frac{\partial^2 U}{\partial u_\alpha\binom{l}{k}\partial u_\beta\binom{l'}{k'}}=-2Q_{\alpha\beta}\begin{pmatrix}l-l' & l-l'\\ kk' & kk'\end{pmatrix}. \qquad (46)$$

$$Q_{\alpha\beta}\begin{pmatrix} l-l' & l-l'' \\ kk' & kk'' \end{pmatrix} = -\frac{1}{2}\Phi_{\alpha\beta}\begin{pmatrix} l-l' \\ kk' \end{pmatrix}\delta_{l'l''}\delta_{k'k''} \quad \text{при } l \neq l',\ k \neq k'. \qquad (47)$$

$\{\alpha\gamma,\beta\delta\} = \{\beta\gamma,\alpha\delta\} = \{\alpha\delta,\beta\gamma\}$, while by the method of homogeneous static deformation the condition for the absence of initial stresses reads: $\{\alpha\gamma,\beta\delta\} = \{\gamma\alpha,\beta\delta\}$. Some simple examples are given, and interaction by the introduction of Q matrices is discussed for special cases. B. Ya. Moyzhes is thanked for his interest and advice. There are 6 references: 1 Soviet-bloc and 4 non-Soviet-bloc.

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors of the AS USSR, Leningrad)

SUBMITTED: July 4, 1960

MOYZHES, B.Ya.; PARFEN'YEV, R.V.; CHUDNOVSKIY, F.A.; EFROS, A.L.

Approximate calculation of the mean group velocities of phonons in cubic crystals. Fiz.tver.tela 3 no.7:1933-1940 Jl '61. (MIRA 14:8)

1. Institut poluprovodnikov AN SSSR, Leningrad.
(Lattice theory)

24.7100: (1160,1136)

25693
S/181/61/003/007/015/023
B102/B214

AUTHOR: Efros, A. L.

TITLE: Approximate calculation of the vibrational spectrum of lead-telluride and lead-sulfide crystals

PERIODICAL: Fizika tverdogo tela, v. 3, no. 7, 1961, 2065-2070

TEXT: On account of their good thermoelectric properties PbTe and PbS are very promising semiconductors. The present paper gives an approximate calculation of the vibrational spectrum of their lattices. Even though both possess an NaCl-type lattice which is characteristic of ionic crystals, the long-range Coulomb interaction is not taken into account as the necessary data are not available (e. g., the static dielectric constant). The approximate calculation is carried out in different ways, account being taken of the overlap forces between the first and the second lattice neighbors. Numerical calculations are made for the directions of highest symmetry, namely, [100], [110], and [111], for which the sixth-order secular equation can be reduced to quadratic equations. To determine the frequency distribution functions and the average group velocity, the

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method of Khauston and an almost equivalent interpolation method are used. The specific heats are also calculated and compared with experimental data. The calculation of the vibrational spectrum leads to the solution of the characteristic equation $\left|C_{il}\left(\vec{f}_{ss'}\right) - m_s\omega^2\delta_{ss'}\delta_{il}\right| = 0$, where i, l=1, 2, 3 (Cartesian indices); s, s'=1,2..n are the indices of the various atoms in the cell; f is the wave vector; and m_s is the atomic mass. The dynamical matrices of interaction between neighboring atoms along the x-axis, between neighboring lead atoms in the [110] direction, and between neighboring tellurium or sulfur atoms in the [110] direction are given by

$$\Phi_{\alpha\beta}(110) = \begin{pmatrix} \alpha_2 & 0 & 0 \\ 0 & \alpha_1 & 0 \\ 0 & 0 & \alpha_1 \end{pmatrix}, \quad (2)$$

$$\Phi_{\alpha\beta}^{Pb}(100) = \frac{1}{2}\begin{pmatrix} \alpha_4 & \alpha_4 & 0 \\ \alpha_4 & \alpha_4 & 0 \\ 0 & 0 & 0 \end{pmatrix} \quad (3)$$

and

$$\Phi^{1,5}_{\alpha\beta}(110) = \frac{1}{2}\begin{pmatrix} \alpha_3 & \alpha_3 & 0 \\ \alpha_3 & \alpha_3 & 0 \\ 0 & 0 & 0 \end{pmatrix}. \quad (4)$$

The force constants α_1, α_2, and $\beta = \alpha_3 + \alpha_4$ can be determined from the elastic constants, which were given by Yu. V. Ilisavskiy. For PbTe $\frac{\alpha_2+\beta}{a} = C_{11} = 10.3 \cdot 10^{11}$; $\frac{\beta - 2\alpha_1}{2a} = C_{12} = 1.2 \cdot 10^{11}$; $\frac{2\alpha_1 + \beta}{2a} = C_{44} = 1.33 \cdot 10^{11}$ dynes/cm^2, a is the distance between the nearest neighbors (3.17 Å for PbTe, 2.98 Å for PbS); C_{12} is not exactly known so that $C_{12} = C_{44}$ has been set equal to $1.33 \cdot 10^{11}$ dynes/cm^2. Different values are given by different authors for C_{ik} of PbS. Two variants are used here. To calculate the distribution functions, use has been made of the equation

$f(\nu)=\frac{4\pi}{3.5}\left[F_1(\nu)+1.6F_2(\nu)+0.9F_3(\nu)\right]$, where $F_{1,2,3}$ are the distribution functions in the directions [100], [110], and [111]. The dispersion relations are graphically differentiated to calculate $F_{1,2,3}$. To verify the method used, the Debye temperature was calculated in the approximation of the theory of elasticity. Use was made of the formula $\Theta = \frac{h}{k}\left(\frac{9n}{v}\right)^{1/3} J^{-1/3}$, where n is the number of atoms in one unit cell, v is the volume of the unit cell, and h and k are the constants of Planck and Boltzmann, respectively. $J=\int\left(\frac{1}{C_l^3}+\frac{1}{C_t^3}+\frac{1}{C_t^3}\right)d\Omega$, where C_i are the sonic velocities, and $d\Omega$ is the element of the solid angle. The specific heat was calculated by the usual formula: $C_v=\int_0^{\infty} C_v(\omega)f(\omega)d\omega$, where $C_v(\omega)$ is the Einstein specific heat. The results are shown graphically, and the agreement with experimental data is seen to be good. The mean group

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velocity for acoustic phonons in PbTe was found by the two methods to be $0.67 \cdot 10^5$ and $0.73 \cdot 10^5$ cm/sec. The values for the optical phonons are $0.47 \cdot 10^5$ and $0.62 \cdot 10^5$ cm/sec, respectively. The author thanks B. Ya. Moyzhes for advice and interest. There are 4 figures and 9 references: 3 Soviet-bloc and 6 non-Soviet-bloc.

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors, AS USSR, Leningrad)

SUBMITTED: December 26, 1960 (initially), February 17, 1961 (after revision)

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28099

S/181/61/003/009/033/039
B108/B138

24.7700 (1144,1160)

AUTHOR: Efros, A. L.

TITLE: Oscillations of the transverse electric conductivity due to scattering from optical phonons in metals and semimetals in a strong magnetic field

PERIODICAL: Fizika tverdogo tela, v. 3, no. 9, 1961, 2848-2858

TEXT: This study is concerned with oscillations of the transverse electric conductivity differing from the Shubnikov-de Haas oscillations. This problem was dealt with recently by V. L. Gurevich and Yu. A. Firsov (ZhETF, 40, no. 1, 1961) for the case of non-degenerate electrons. The present paper is based on formulas obtained by L. E. Gurevich and G. M. Nedlin (ZhETF, 40, 809, 1961). The transverse electric conductivity for an isotropic and quadratic spectrum has the following form:

$$\sigma_{xx}=\frac{4\pi e^2}{H^2kTV}\sum_{\alpha\alpha'}\sum_{q}|I_{\alpha\alpha'}|^2\delta_{p_y,\, p'_y-\hbar q_y}\delta_{p_z,p'_z-\hbar q_z}|C_q|^2N_q\times \\ \times n_\alpha(1-n_{\alpha'})\delta(\omega_{\alpha\alpha'}+\omega_0)q_y^2, \qquad (1)$$

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where $\vec{q}$ is the phonon wave vector, $\vec{p}$ - the electron momentum. The magnetic field is applied in the z direction. The vector potential is chosen so that the oscillation functions are in the x direction:

$$I_{nn'} = \int_{-\infty}^{\infty} e^{iq_x x} \varphi_n(x - x_0) \varphi_{n'}(x - x_0') dx, \qquad (2)$$

$\varphi_n(x - x_0)$ is the normalized wave function of the oscillator. In the quasiclassical case, in which $\zeta - \hbar\omega_0 \gg \hbar\omega$, the transverse electric conductivity is given by

$$\sigma_{xx} = \frac{e^2 e^{-\frac{\hbar\omega_0}{kT}} V}{(2\pi)^4 \hbar^2 \omega kT} \int_{\zeta-\hbar\omega_0}^{\zeta} \sum_{nn'} \frac{G_{nn'}(\varepsilon)\, d\varepsilon}{\sqrt{\varepsilon - \hbar\omega\left(n+\frac{1}{2}\right)}\sqrt{\varepsilon + \hbar\omega_0 - \hbar\omega\left(n'+\frac{1}{2}\right)}}. \qquad (9)$$

ζ denotes the Fermi energy, ω_0 - the frequency limit of the optical phonons, ω - the Larmor frequency, $G_{nn'}(\zeta) = \iint dq_x dq_y |C_q|^2 |I_{nn'}|^2 q_y^2$. The expression $|C_q|^2 = \frac{A}{q^2V}$ is given for polarized optical phonons. The factor A can be found in papers by B. I. Davydov and I. M. Shmushkevich (UFN, XXIV, (1), 21, 1940) and M. A. Krivoglaz and S. I. Pekar (Izv. AN SSSR, ser. fiz., XXIV, (1), 1957). Near the oscillation maxima, the transverse conductivity assumes the form $\sigma_{xx}^{osc.} = \frac{e^2\exp(-\hbar\omega_o/kT)mA\omega_o}{4\pi^3\hbar^3kT\omega}\ln\delta(1-\delta)$. m denotes the effective electron mass, δ varies between zero and unity. The monotonic portion of the electric conductivity is obtained from the solution of the equation of motion. It has the form

$\sigma_{xx}^{m.} = \frac{2}{3}\frac{e^2\exp(-\hbar\omega_o/kT)\omega_o m\zeta A}{\hbar^4\omega^2kT\pi^3}$. In the quantum limit, where the Fermi energy is less than $\hbar\omega$, the transverse conductivity has the following form:

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$$\sigma_{xx}=\frac{e^2 e^{-\frac{\hbar\omega_0}{kT}} V}{(2\pi)^4 \hbar^2\omega kT}\sum_n \int_{\varepsilon_{min}}^{\zeta} \frac{G_{0n}(\varepsilon)\, d\varepsilon}{\sqrt{\varepsilon-\frac{\hbar\omega}{2}}\sqrt{\varepsilon+\hbar\omega_0-\hbar\omega\left(n+\frac{1}{2}\right)}}; \qquad (29)$$

Since $\varepsilon_{min} \gg \frac{\hbar\omega}{2}$, the region of integration in this formula is very small. $G_{0n}(\varepsilon)$ may therefore be replaced by $G_{0n}(\zeta)$. n denotes the electron concentration. In calculating the remaining integral one has to observe two cases: (1) $\hbar\omega_0 < n\hbar\omega$ so that $\varepsilon_{min} = \hbar\omega(n + 1/2) - \hbar\omega_0$. (2) $\hbar\omega_0 > n\hbar\omega$ so that $\varepsilon_{min} = \hbar\omega/2$. In both cases, however, $\zeta > \hbar\omega(n + 1/2) - \hbar\omega_0$. The transverse conductivity is calculated for the case that $\frac{3}{2}\hbar\omega - \hbar\omega_0 < \zeta < \frac{5}{2}\hbar\omega - \hbar\omega_0$, resulting in the expression

$$\sigma_{xx}=\frac{4me^2e^{-\frac{\hbar\omega_0}{kT}}A}{(2\pi\hbar)^3kT}\left\{\left(\frac{y\omega_0}{\omega}\right)^{1/2}\left[\frac{\omega_0}{\omega}e^{\frac{\omega_0}{\omega}}Ei\left(-\frac{\omega_0}{\omega}\right)+1\right]+\right. \tag{36}$$

$$\left.+\ln\frac{\sqrt{y}+\sqrt{x}}{\sqrt{\pm(y-x)}}\left[1-x-x^2e^xEi(-x)\right]\right\},$$

where

$$y=\zeta^*-\frac{1}{2}=\frac{\pi^4\hbar^6n^2}{2m^3(\hbar\omega)^3},$$

$$x=\zeta^*+\frac{\omega_0}{\omega}-\frac{3}{2}=\frac{\pi^4\hbar^6n^2}{2m^3(\hbar\omega)^3}+\frac{\omega_0}{\omega}-1.$$

The sign under the root in the lagarithmic expression must be chosen so that the root is real. V. L. Gurevich, L. E. Gurevich, and Yu. A. Firsov are thanked for discussions. There are 7 references: 5 Soviet and 2 non-Soviet. The reference to an English-language publication reads as follows: E. N. Adams, T. D. Holstein. J. Phys. Chem. Sol., 10, 254, 1959.

28099 S/181/61/003/009/033/039
Oscillations of the transverse electric ... B108/B138

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR Leningrad (Physicotechnical Institute imeni A. F. Ioife of the AS USSR Leningrad)

SUBMITTED: May 31, 1961

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31796
S/056/61/041/006/047/054
B109/B102

24.7000 (1137,1143,1144,1385)

AUTHORS: Gurevich, L. E., Efros, A. L.

TITLE: Effect of mutual dragging of electrons and phonons on the transverse electrical conductivity in a strong magnetic field

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 6(12), 1961, 1978-1985

TEXT: It is shown that dragging of phonons by electrons changes the transverse electrical conductivity in a strong magnetic field at low temperatures ($T \ll \Theta$). A magnetic field H with $\omega\tau \gg 1$ is assumed to exist in the z-direction of a crystal. $\omega = eH/mc$, m is the effective electron mass, and τ is the electron relaxation time. The relaxation time τ_{Φ} in phonon-electron interaction is taken to be smaller than the relaxation time τ_{Φ} if phonons release their energy without participation of electrons. $\sigma_{\text{д}}$ is taken to denote the so-called "defect conductivity", and σ_{Φ} the "phonon conductivity". Then, the transverse current consists of the components $j = j_1 + j_2$; j_1 is the part of current without dragging for

31796
S/056/61/041/006/047/054
B109/B102

Effect of mutual dragging of...

which, according to L. E. Gurevich, G. M. Nedlin (ZhETF, 40, 809, 1961), the expression

$$j_1 = \frac{2\pi e}{V\hbar^2 T} \sum_{\alpha\beta q} |J_{\beta\alpha}|^2 |C_q|^2 N_q n_\alpha (1 - n_\beta)\, \delta(\omega_{\alpha\beta} + \omega_q)\, X^2_{\beta\alpha} eE. \qquad (1)$$

following from the phonon balance holds, while j_2 is given by

$$j_2 = \frac{2\pi e}{\hbar^2 V} \sum_{\alpha\beta q} |C_q|^2 |J_{\alpha\beta}|^2 n_\alpha (1 - n_\beta)\, \delta(\omega_{\beta\alpha} - \omega_q)\, X_{\beta\alpha} \frac{g_q}{N_q + 1}. \qquad (11)$$

which is related to phonon absorption and emission. In (11), α, β are the quantum numbers of an electron in a homogeneous magnetic field, n_α is the equilibrium Fermi function, N_q Planck's function, ω_q the phonon frequency, $J_{\beta\alpha}$ the matrix element of the operator $e^{i\vec{q}\vec{r}/\hbar}$, $\vec{q}$ the phonon momentum, $\vec{X}_{\beta\alpha} = \vec{X}^o_\beta - \vec{X}^o_\alpha$ is the displacement of the oscillator center on the transition from state α into state β, $C_q = E_o\sqrt{qa^3/MsV}$, E_o is the deformation potential, M the mass of a unit cell, s the sound velocity, and a the lattice constant. Deviation of the phonon distribution function from equilibrium:

$$g_q = -\frac{\tau_\Phi}{\tau_\Phi + \tau_{\Phi_9}} N_q (N_q + 1) \frac{E}{H} \frac{cq_y}{T}. \qquad (9).$$

$$\sigma_\Phi = \frac{c^2}{H^2 TV} \sum_q q_y^2 N_q (N_q + 1)/(\tau_\Phi + \tau_{\Phi_9}). \qquad (13)$$

is obtained accordingly. When considering the case of $\hbar\omega \ll \zeta$ and $2\sqrt{2m\zeta} > T/s$, ζ being the chemical potential,

$$\sigma_\Phi \approx \left(\frac{T}{ms^2}\right)^2 \left(\frac{T}{\hbar\omega}\right)^2 \frac{e^2}{a\Theta} \frac{s}{L}. \qquad (19)$$

holds, i.e., the electrical conductivity is a function of the specimen dimensions in y-direction which is perpendicular to the electrical and the magnetic field. In addition,

$$\frac{\sigma_\Phi}{\sigma_A} \sim 10 \left(\frac{T}{\Theta}\right)^4 \frac{1}{(na^3)^{4/3}} \frac{a}{Lx}. \qquad (22)$$

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Effect of mutual dragging of...

For $T < \Theta$,

$$\sigma_{\Phi} \sim 10^2 \frac{e^2}{a\hbar} \frac{\Theta}{Ms^2}\left(\frac{T}{\hbar\omega}\right)^2 \left(\frac{T}{ms^2}\right)^2 e^{-\Theta/aT}, \quad (23)$$

holds. If $\hbar\omega \ll \zeta$ and $\sqrt{2m\zeta} < T/s$,

$$\sigma_{\Phi} \approx \frac{e^2}{\hbar a}\left(\frac{\zeta}{\hbar\omega}\right)^2 \frac{T}{Ms^2}\left(\frac{T}{\Theta}\right)^4.$$

If, however, $\hbar\omega \gg T$ and $\tau_{\Phi} = Aq^{-t}$, one obtains

$$\sigma_{\Phi} = \frac{c^2}{s^2} \frac{T q_H^{l+2} \sqrt{8mT}}{H^2 (2\pi\hbar)^2 A} \int \frac{\eta^{l+1} d\xi d\eta}{1 + C\xi\eta^{l-2} \exp(\xi^2 + \eta^2)}, \quad (26)$$

where $\xi = q_z/\sqrt{8mT}$, $\eta = q_{\perp}/q_H$, $q_{\perp}^2 = q_x^2 + q_y^2$, $q_H^2 = 2eH\hbar/c$, $C = \left(\frac{T}{E_0}\right)^2 \frac{s}{\omega L} \frac{M}{m} \frac{1}{na^3}$.

The behavior of C indicates that the dragging effect is the stronger the higher electron concentration and the lower temperature are. As for semiconductors, scattering from impurity ions is significant:

$$\frac{\sigma_H}{\sigma_{\Phi}} \approx \frac{100}{e^2} (nNa^6) \frac{e^4}{a^2 T^2} \frac{L}{a} \left(\frac{q_H a}{\hbar}\right)^2 \frac{\Theta}{T}. \quad (31), \qquad \sigma_H \approx nNe^6/(mT)^{1/2}\omega^2\varepsilon^2. \quad (30).$$

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As a result a dragging effect may appear in magnetic fields of the order of 10 koe at about $10^{\circ}K$ with electron and defect concentrations of $N \sim n \sim 10^{14}/cm^3$. The experimental observation of this effect is based on the fact that the scattering by impurity ions causes a weak (evidently logarithmic) dependence of ϱ_{xx} on H. There are 5 references: 4 Soviet and 1 non-Soviet. The two references to English-language publications read as follows: E. Adams, T. Holstein, J. Phys. Chem. Sol., 10, 254, 1959; P. Klemens. Solid. St. Phys., 7, N. Y., 1958.

ASSOCIATION: Leningradskiy fiziko-tekhnicheskiy institut Akademii nauk SSSR (Leningrad Physicotechnical Institute of the Academy of Sciences USSR)

SUBMITTED: July 21, 1961

26.2420
9.4178

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S/181/62/004/005/023/055
B125/B108

AUTHORS: Shalyt, S. S., and Efros, A. L.

TITLE: Quantum oscillation of the galvanomagnetic effects in indium arsenide and indium antimonide

PERIODICAL: Fizika tverdogo tela, v. 4, no. 5, 1962, 1233-1240

TEXT: The quantum theory of electrical conductivity of a degenerate electron gas in a strong transverse magnetic field leads to the formulas of H. P. R. Frederikse, W. R. Holser (H. P. R. Frederikse, W. R. Holser. Sol. St. Phys., Electron and Telecommun., 2, 651, 1960).which determine the position of the maxima , but not those of the minima of the oscillatory curves of reluctance . An electric field applied in the x-direction to InAs and InSb crystals causes an asymmetry in the shifted electrons and, consequently, a current j_x. The formula

$$\left(\frac{1}{H}\right)_{max} = \frac{2e}{\hbar c}\left(\frac{1}{3\pi^2}\right)^{2/3}\frac{1}{n^{2/3}}\left[\left(l+\frac{1}{2}\right)^{3/2}-\left(\frac{1}{2}\right)^{3/2}\right]^{2/3}. \quad (8)$$

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for the values of $\frac{1}{H}$ at which these maxima occur (according to Frederikse and Holser) has to be supplemented by the factor $(1+\sqrt{kT/\hbar\omega}\ 0.53)^{2/3}$. To verify the quantum-theoretical conclusions, the resistivity and Hall effect of an n-type InAs sample (consisting of 3 - 4 single crystals) were measured with direct current. Results obtained with a weak field shown in Fig. 1 ($R=212$ cm^3/coul, $\sigma=120$ ohm^{-1}cm^{-1}) indicate an electron concentration of $3\cdot10^{16}$ cm^{-3} and a Hall mobility of 25,500 cm^2/v·sec. The factor before the brackets in (8) determines the quasi-period of oscillations in magnetic resistivity. For $n=3\cdot10^{16}$ cm^{-3}, it amounts to $\Delta(1/H)^{theor} \simeq 3.3\cdot10^{-5}$ oe^{-1}. Theoretical and experimental data are in good agreement. The data contained in Fig.2 were obtained for the same sample as shown in Fig. 1, but three months later. Aging lowered n by 10% and shifted the oscillating curve of transverse reluctance to the left. The experimental data on the quantum oscillation maxima (but not on the minima) of transverse reluctance in InAs and InSb can be evaluated. There are 2 figures and 5 tables.

Quantum oscillation of the ... S/181/62/004/005/023/055
B125/B108

ASSOCIATION: Institut poluprovodnikov AN SSSR (Institute of Semiconductors AS USSR); Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR Leningrad (Physicotechnical Institute imeni A. F. Ioffe AS USSR, Leningrad)

SUBMITTED: December 28, 1961

Fig. 1: Dependence of transverse reluctance on magnetic field strength. $T = 4.2^{\circ}K$ - solid curve; $T = 2^{\circ}K$ - dotted curve. Upper part - Hall coefficient at $T = 2^{\circ}K$. H, koe.

Fig. 2: Transverse reluctance and Hall coefficient at $T = 4.2^{\circ}K$.

Card 3/5

GUREVICH, V.L.; FIRSOV, Yu.A.; EFROS, A.L.

New type of magnetoresistance oscillations in semidonductors and semimetals. Fiz.tver.tela 4 no.7:1813-1819 Jl '62.
(MIRA 16:6)

1. Institut poluprovodnikovAN SSSR, Leningrad.
(Magnetoresistance) (Semiconductors--Electric properties)

24.7600

S/181/62/004/010/046/063
B102/B112

AUTHORS: Natadze, A. L., and Efros, A. L.

TITLE: Effect of the mutual entrainment of electrons and phonons on the thermo-emf and the Nernst effect

PERIODICAL: Fizika tverdogo tela, v. 4, no. 10, 1962 2931-2939

TEXT: Gurevich and Obraztsov (ZhETF, 32,390,1957) have already studied how the entrainment of electrons by phonons affects the thermomagnetic phenomena in semiconductors. If the electron concentrations are not small, and if the phonon relaxation with respect to the electrons is considerable, the inverse effect has to be taken into account also. This was done for non-degenerate semiconductors by Appel (Zs.Naturforsch. 12a, 410,1957). The effect of the mutual entrainment of degenerate semiconductors placed in a strong magnetic field is studied, "strong" meaning that $\omega\tau \gg 1$ where $\omega = eH/mc$ and τ is the relaxation period. For simplicity an isotropic square dispersion law is assumed for the electrons. The thermo-emf and the transverse Nernst effect are calculated using the Herring technique (Phys.Rev.96,1163,1954). It can be shown that

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Effect of the mutual entrainment ... S/181/62/004/010/046/063
B102/B112

if the mutual entrainment is taken into account the thermo-emf related to ζ/kT increases where ζ is the chemical potential of the electrons, and also that the temperature dependence of the transverse Nernst coefficient of $N \sim T^2$ on $N \sim T^6$ changes.

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR, Leningrad (Physicotechnical Institute imeni A.F. Ioffe AS USSR, Leningrad)

SUBMITTED: June 14, 1962

Card 2/2

24.7700

S/056/62/043/002/023/053
B104/B108

AUTHORS: Gurevich, L. E., Efros, A. L.

TITLE: The effect of spin on the Shubnikov-de-Haas oscillations as a possible method of determining the effective mass of carriers

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 2(8), 1962, 561-563

TEXT: The transverse electric conductivity of a semiconductor in a strong ($\Omega\tau \gg 1$) quantizing magnetic field ($\hbar\Omega \gg t$), $\mu H \gg T$) is

$$\sigma_{\perp} = \sum_{n,n'} \frac{G_{nn's}(\zeta)}{\left[\zeta - \hbar\Omega\left(n + \frac{1}{2}\right) + s\mu H\right]^{1/2}\left[\zeta - \hbar\Omega\left(n' + \frac{1}{2}\right) + s\mu H\right]^{1/2}} \quad (4),$$

$$G_{nn's}(\zeta) \sim \int A_{nn'}(q)\, dq_x dq_y, \quad (5),$$

Card 1/2

GUREVICH, V.L.; EFROS, A.L.

Theory of the electroacoustic effect. Zhur. eksp. i teor. fiz. 44 no.6:2131-2141 Je '63. (MIRA 16:6)

1. Fiziko-tekhnicheskiy institut im. A.F. Ioffe AN SSSR. (Electroacoustics)

L 00763-66 EWT(1)/T/EWA(h) IJP(c) AT

ACCESSION NR: AP5012565 UR/0181/65/007/005/1501/1505

AUTHOR: Efros, A. L. 44,55

TITLE: Contribution to the theory of oscillations of longitudinal magnetoresistance

SOURCE: Fizika tverdogo tela, v. 7, no. 5, 1965, 1501-1505

TOPIC TAGS: magnetoresistance, galvanomagnetic effect, semiconductor property, quantum number 21,44,55

ABSTRACT: The purpose of the article was to explain the experimentally verified fact that the maxima of the longitudinal magnetoresistance coincide with the maxima of the transverse resistance, but no maximum corresponding to a principal quantum number $n = 0$ is observed in longitudinal magnetoresistance. To this end, the oscillations of the longitudinal magnetoresistance of degenerate semiconductors is analyzed with account of spin splitting of the Landau levels. It is shown that if $kT \ll \mu H$, where μ is the spin magnetic moment of the electron, and if $T_D \ll T$, where kT_D is the energy smearing of the levels resulting from the collisions, then the maxima of the longitudinal and transverse magnetoresistance coincide. However, if the probability of transition with spin flip is small, then the maximum corresponding to a zero Landau quantum number should be missing, as is indeed observed in

Card 1/2

L 00763-66
ACCESSION NR: AP5012565

the experiment. "I thank V. L. Gurevich and Ye. G. Strel'chenko for very useful discussions." Orig. art. has: 1 figure and 14 formulas.

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR, Leningrad (Physicotechnical Institute AN SSSR)

SUBMITTED: 28Dec64 ENCL: 00 SUB CODE: SS, EM

NR REF SOV: 003 OTHER: 002

Card 2/2

amplification in the active region. Orig. art. has: [illegible] formulas.

L 24401-66 EWT(1)/T IJP(c)

ACC NR: AP6011005 SOURCE CODE: UR/0056/66/050/003/0809/0817 lation β = Dn/T. By way of an example the author obtains expressions for a single-component gas in a specified field, and for semiconductors with isotropic and quadratic spectra. A rigorous theory of the thermal diffusion of Brownian particles in a gas is outlined on the basis of the results. The author thanks V. L. Gurevich, L. E. Gurevich, O. V. Konstantinov, V. I. Perel', L. P. Pitayevskiy, and G. M. Eliashberg for useful discussions and valuable advice. Orig. art. has : 53 formulas

SUB CODE: 20/ SUBM DATE: 20Oct65/ ORIG REF: 003/ OTH REF: 005

Card 2/2

L 46329-66 EWT(1)/T IJP(c) AT

ACC NR: AP6015465 SOURCE CODE: UR/0181/66/008/005/1467/1478

41

B

AUTHOR: Konstantinov, O. V.; Efros, A. L.

ORG: Physics Engineering Institute im. A. F. Ioffe, AN SSSR, Leningrad (Fiziko-tekhnicheskiy institut AN SSSR)

2/

TITLE: A strong injection in a nondegenerate p-n transition

SOURCE: Fizika tverdogo tela, v. 8, no. 5, 1966, 1467-1478

TOPIC TAGS: pn transition, hole injection, nondegenerate transition, volt ampere characteristic

ABSTRACT: The authors discuss the approximate solution obtained by them to describe the entire process of concentration of injected holes. This solution holds true when the drift length is substantially greater than the diffusion length. The problem of the voltage drop in the transition ($\delta\psi$) itself is also discussed. The solution obtained is more accurate that the drift approximation due to C. Herring (Bell Syst. Tech. J., 28, 401, 1949). A relationship is found between the injected concentration and the current and the volt-ampere characteristic of such a diode. In conclusion the authors wish to express their sincere gratitude to B. V.

Card 1/2

L 46829-66

ACC NR: AP6015465

Tsarenkov for useful discussions, as well as to I. V. Kirillova for making the calculations on an electronic computer. Orig. art. has: 1 table, 1 figure and 60 formulas.

SUB CODE: 20/ SUBM DATE: 08Oct65/ ORIG REF: 006/ OTH REF: 007

Card 2/2 blg

ACC NR: AP7003211

SOURCE CODE: UR/0056/66/051/006/1693/1702

AUTHOR: Gurevich, V. L.; Efros, A. L.

ORG: Institute of Semiconductors, Academy of Sciences, SSSR (Institut poluprovodnikov Akademii nauk SSSR)

TITLE: Second sound and absorption of ordinary sound in dielectrics

SOURCE: Zh eksper i teor fiz, v. 51, no. 6, 1966, 1693-1702

TOPIC TAGS: sound absorption, dielectric material, acoustic effect, acoustic damping

ABSTRACT: The authors derive a set of microscopic equations describing the transport of heat in dielectrics in low temperatures, when the characteristic time of the normal processes is short compared with the characteristic time of umklapp processes. The purpose of the calculation is to indicate a new method of investigating second sound and phenomena related to it. This method is based on the interaction between the second sound and ordinary sound. . It is shown that measurement of the absorption coefficient (and of the velocity) of ordinary sound at sufficiently high frequencies makes it possible to investigate the region of existence of second sound and various quantitative characteristics of the second sound. New data obtained as a result of this investigation are a quantitative thoery of the damping of second sound, a theory for the interaction of first and second sound, and a theory for the damping of first sound in the region of frequencies where dispersion of thermal conductivity comes into play. Orig. art. has: 1 figure and 50 formulas.

SUB CODE: 20/ SUBM DATE: 11Apr66/ ORIG REF: 002/ OTH REF: 008

Card 1/1

EFROS, A.

Resolution of racemic glycols of the acetylene series into optically active isomers. Yu. S. Zal'kind and A. Efros. *Zhur. Obshchei Khim.* (J. Gen. Chem.) 19, 812-8(1949). [PhCH(OH)C:]$_2$, m. 142° (9 g.), in 100 ml. dry Et_2O was warmed 8 hrs. with 1.4 g. powd. K, the mixt. stirred 15 hrs. with 5.5 g. o-$C_6H_4(CO)_2O$, and the pptd. K salt of the acid phthalate rapidly filtered off and shaken in 150 ml. C_6H_6 with 75.5 ml. 0.1 N H_2SO_4; evapn. of the org. layer after drying, followed by soln. in Me_2CO and 48 hrs.' standing, gave colorless crystals partly sol. in Et_2O; the sol. fraction was *PhCH(OCOC$_6$H$_4$CO$_2$H)C:CCH(OH)Ph*, m. 150-1° (from Et_2O, then from Me_2CO) (13.8% yield); on slow heating $C_6H_4(CO)_2O$ sublimes from the ester. The product (1 g.) warmed with 0.81 g. *cinchonine* in $CHCl_3$ 0.5 hr. gave a sirupy *salt* which on stirring with ligroin crystd., m. 82-4°. This was resolved into *optical isomers* ([α] −16.5° and +15°) by fractional pptn. from CCl_4 by petr. ether, and the resolved isomers of the salt converted to the isomeric phthalates by 4% HCl; these warmed with 5% $NaHCO_3$ (5 ml./0.2 g. ester in 5 ml. $CHCl_3$) 10 min. to 70-80° gave on evapn. of the org. layer the isomeric *glycols*: $[\alpha]^{14}$ −33.3° and 30° ($CHCl_3$), $[\alpha]^{19}$ −25° and 21.6° (Me_2CO), m. 141-4° (from Me_2CO-EtOH). The Et_2O-insol. fraction (see above) was identified as [*PhCH(O$_2$CC$_6$H$_4$CO$_2$H)C:*]$_2$, m. 151-2° (from Me_2CO); warmed with *cinchonidine* in $CHCl_3$, it gave the corresponding *salt*, $C_{70}H_{66}O_{10}N_4$, m. 90-2°, which was fractionally crystd. from $CHCl_3$-petr. ether, the products treated with 4% HCl giving the *optically isomeric diphthalates*, m. 150-63°, $[\alpha]^{18}$ 30° and −40° (in $CHCl_3$). $Me_2C(OH)C{:}CCH(OH)Ph$, m. 70.6°, (10 g.) treated with 2 g. K in 50 ml. Et_2O, followed by 7 g. o-$C_6H_4(CO)_2O$ as above, gave 39.35% *Me$_2$C(OH)C:CCH(O$_2$CC$_6$H$_4$CO$_2$H)Ph*, m. 137-8° (from EtOAc), also obtained in 81% yield by warming 15.2 g. glycol, 11.5 g. $C_6H_4(CO)_2O$, and 10 ml. pyridine 1.5 hrs. to 60-5° and letting stand 48 hrs., followed by shaking with 70 ml. 10% HCl and extn. with Et_2O; warmed with *cinchonine* in CCl_4, the ester gave the corresponding *salt*, m. 89-91° (from CCl_4-petr. ether), resolved by crystn. from $CHCl_3$-petr. ether and converted to the *active isomeric esters*, m. 142-4° (from EtOAc), $[\alpha]^{16}$ −12° and 12.5° ($CHCl_3$), which were sapond. by 4% $NaHCO_3$-$CHCl_3$ 10 min. at 60-70° to the isomeric *glycols*, m. 74-7° (from $CHCl_3$), [α] −10° and 10° (Me_2CO). The racemic glycol itself was partially resolved by slow crystn. from *l*-bornyl acetate (max. rotations −10° and 7° in $CHCl_3$); such resolution by optically active solvents is believed to occur through the possibility of H bond formation between solute and solvent.

G. M. Kosolapoff

EFROS, A.

PA 65/49T17

USSR/Chemistry - Glycols, Acetylenic Isomers; Racemates — Apr 49

"Cleavage of Racemic Glycols of the Acetylene Series Into Optically Activated Isomers," Yu. Zal'kind (deceased), A. Efros, Lab of Org Chem, Leningrad Chemicotech Inst imeni Lensovet, 6 3/4 pp

"Zhur Obshch Khim" Vol XIX, No 4

Two such gylcols, specifically diphenylbutinediol (melting point 142o) and dimethylphenylbutinediol were split into their optically active components. In addition, the optically active isomers of the mono-and diphthalic esters of diphenylbutinediol

65/49T17

USSR/Chemistry - Glycols, Acetylenic (Contd) — Apr 49

and the phthalic ester of dimethylphenylbutinediol were formed. Showed the possibility of splitting the racemic isomer of dimethylphenylbutinediol into its optically active components by means of fractional crystallization from optically active acetobornyl ether. Suggested that the cleavage of the racemates through crystallization from active solvents may possibly be attributable to the formation of a hydrogen bond between the molecules of the racemates and the solvent. Submitted 20 Jan 48.

65/49T17

AUTHORS: Zakharova, A. I., Efros, A. M. SOV/79-28-12-17/41

TITLE: On the Problem of the Cyano-Ethylation of Acetylene-γ-Glycols (K voprosu tsianetilirovaniya atsetilenovykh γ-glikoley)

PERIODICAL: Zhurnal obshchey khimii, 1958, Vol 28, Nr 12, pp 3243-3245 (USSR)

ABSTRACT: Recently Efros (Ref 2) investigated the cyano-ethylation reaction in the series of benzimidazole in the presence of triethyl-benzyl ammonium hydroxide. It was interesting to use this catalyst also in the cyano-ethylation of unsaturated hydroxyl-containing compounds, especially of acetylene-γ-glycols. The authors, therefore, cyano-ethylated the tetramethyl and tetraphenyl butynediol in the presence of this catalyst. With the former this reaction takes place very easily on the addition of the double amount of acrylonitrile to the solution of glycol in dioxane under the formation of heat and slight resinification. After 24 hours standing at room temperature and pouring the reaction mixture into water crystals of tetramethyl butynediol ether are separated, which have a melting-point of 37-38° (yield 65%). The yield of the monocyano-ethyl ether of this glycol obtained

under the same conditions amounted only to 8-10%. Thus the above catalyst can also be used efficiently in the cyano-ethylation of tetramethyl butynediol, as this reaction takes place easier than that suggested by Nazarov and his cooperators (Ref 1), and the final product does not need tedious purification. The cyano-ethylation of tetraphenyl butynediol (I) carried out in the same was as mentioned above also takes place easily, but with a somewhat larger excess of acrylonitrile. The final product is the di-(β-cyano-ethyl)-ether of tetraphenyl butynediol (II), (melting-point 179-180°). Its yield amounted to 52.6%. From the reaction mass remaining the mono-β-cyano-ethyl ether of glycol (III) was obtained (melting point 68-69°) (yield 26.5%). Both of these ethers had been unknown before. There are 2 Soviet references.

ASSOCIATION: Leningradskiy sel'skokhozyaystvennyy institut (Leningrad Agricultural Institute)

1ST AND 2ND ORDERS

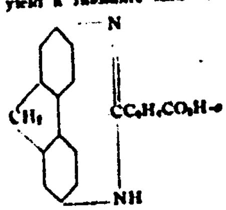
PROCESSES AND PROPERTIES INDEX

EFROS, A.M.

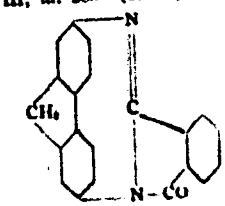
Ca

10

Fluorene. I. Condensation of 2,7-diaminofluorene with phthalic anhydride. B. A. Porai-Koshits and A. M. Efros. *Bull. acad. sci. U. R. S. S., Classe sci. math. 1939,* No. 3, 43 (in; cf. C. A. 33, 6259. 2,7-Diaminofluorene (I) and o-$C_6H_4(CO)_2O$ (II) in H_2O (8 hrs. at the b. p.) yield a *substance* said to be III, m. 280° (decompn.),



(III)



(V)

together with *2,7-diphthalimidofluorene* (IV), m. 362°. III is converted into a *substance* (V), m. 340°, by heating in Ac_2O or C_5H_5N (at the b. p.), or by heating alone at 120°; V is also prepd. from I and II in $PhNMe_2$ at the b. p. 2-Aminofluorene and II in $PhNMe_2$ (2.5 hrs. at the b. p.) yield *2-phthalimidofluorene*, m. 276°, the *7-NO₂ deriv.*, m. 308°, of which is reduced (Zn in EtOH-$CaCl_2$) to *7-amino-2-phthalimidofluorene* (VI), m. 263°, from which V is obtained by boiling for 5 hrs. with $PhNMe_2$. VI and BzH (25 min. at the b. p.) yield *2-benzylideneamino-7-phthalimidofluorene*, m. 246°, regenerating VI and BzH when hydrolyzed (10% HCl). VI and II in $PhNMe_2$ (5 hrs. at the b. p.) afford IV, while in EtOH (2 hrs. at the b. p.) the product is *2-phthalimido-7-fluorenylphthalamic acid*. V and BzH (35 min. at the b. p.) give the 9-benzylidene deriv. of V, m. 367°. 2-Aminofluorene and BzH (30 min. at the b. p.) yield *2-benzylideneaminofluorene*, m. 152°, readily hydrolyzed by acids. B. C. P. A.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

CA EFROS, A.M.

The work of L. A. Chugaev in the field of optically active compounds. M. V. Vol'kenshtein and A. M. Efros. *Uspekhi Khim.* 19, 609-18(1950).—Review; ~~40 references.~~ N. Thon
Portrait of Chugaev.

AUTHOR: ~~Efros, A. M.~~ 79-28-3-11/61

TITLE: Cyano-Ethylation of Benzimidazolon and Mercaptobenzimidazol (Tsianetilirovaniye benzimidazolona i merkaptobenzimidazola)

PERIODICAL: Zhurnal Obshchey Khimii, 1958, Vol. 28, Nr 3, pp. 617-619 (USSR)

ABSTRACT: Recently publications have been numerous on the derivatives of urea and thiourea for pest control and as stimulators for the growth of plants. Thus it is known that N-4-chlorophenyl = N,N'-dimethylurea and similar urea compounds are used for this. Cyclic urea and thiourea have not been investigated in this respect. Benzimidazolon could be of a certain interest for the synthesis of pest control agents of which two tautomers (see formulae I and II) exist of which, however, (I), i.e. orthophenylene-urea is predominant. Thus benzimidazolon is a cyclic urea derivative, which was proved spectroscopically as well as by its reactivity. In the present work the authors aim at cyanethylating benzimidazolon and mercaptobenzimidazol in the presence of a quaternary base in order to find in which way the reaction

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with acrylnitrile could then proceed for the given products, and in order to obtain compounds which, according to their opinion, were bound to have physiological activity. The cyano-ethylation of benzimidazolon took place at 40-50 %, only with triethylbenzylammonium-hydroxide being present as catalyst. When this reaction is carried out equimolecularly, alsways two radicals of the alkylnitrile enter the molecule of both compounds. The result of the cyano-ethylation of benzimidazolon was a good yield (80 %) of dinitrile-N,N'-dicyanoethylbenzimidazolon (III). In the hydrogenation of the dinitrile (III) with bariumhydroxide in water the barium salt of the N,N'-dicarboxyethylbenzimidazolon was obtained. This salt, after treatment with sulfuric acid, gave a two-basic acid N,N'-dicarboxyethylbenzimidazolon (IV) with a yield of 80 %. The cyano-ethylation of mercaptobenzimidazol (V) takes place after longer heating and at higher temperature. Thus correspondingly the N,N'-dicyanoethylbenzimidazolon and N,N'-dicyanoethylbenzimidazolation are obtained by the cyano-ethylation of the two initial products in the presence of

triethylbenzylammoniumhydroxide. The products of hydrogenation of the dinitriles with bariumhydroxide have hitherto not been synthetized.
There are 10 references, 5 of which are Soviet.

ASSOCIATION: Leningradskiy sel'skokhozyaystvennyy institut (Leningrad Agricultural Institute)

SUBMITTED: December 30, 1956

EFROS, A.M.

Cyanoethylation reaction in the series of nitrogen heterocycles. Part 2: Cyanoethylation of 5(6)-nitro-and 2-methyl-5(6)-nitrobenzimidazoles. Zhur. ob. khim. 30 no.11:3565-3569 N'60. (MIRA 13:11)

1. Leningradskiy sel'skokhozyaystvennyy institut.
(Cyanoethylation) (Benzimidazole)

EDEL'MAN, N.M.; EFROS, A.M.

Effect of growth-promoting substances on phytophagous insects. Dokl. AN SSSR 142 no.5:1172-1175 F '62. (MIRA 15:2)

1. Vsesoyuznyy institut zashchity rasteniy i Leningradskiy sel'skokhozyaystvennyy institut. Predstavleno akademikom Ye.N.Pavlovskim.

(BENZIMIDAZOLE)
(INSECTS—FOOD)

EFROS, A.M.; FEDOSEYEVA, M.P.

Effect of benzimidazole derivatives on the growth and development of cereal crops. Dokl. AN SSSR 146 no.1:236-237 S '62.
(MIRA 15:9)

1. Leningradskiy sel'skokhozyaystvennyy institut. Predstavleno akademikom A.L. Kursanovym.
(Benzimidazole) (Grain) (Growth promoting substances)

EFROS, B.D.

Deposit of optic fluorites. Zap.Vses.min.ob-va 89 no.2:187-194 '60. (MIRA 13:7)

(Fluorite)

KUNTSEVICH, D.Ye., dotsent; EFROS, B.I., kandidat meditsinskikh nauk (Vil'nyus)

Diagnosis of primary gastric sarcoma. Khirurgiia no.7:84 Jl '55.
(STOMACH--TUMORS) (MLRA 8:12)

EFROS, B.I. (Boris Izrailevich)

EFROS, B.I., kand.med.nauk

A new modification in fusion of the pharyngeal and intestinal stoma in forming an artificial esophagus by means of Filatov's stalk. Khirurgiia 33 no.6:29-34 Je '57. (MIRA 10:12)

1. Iz khirurgicheskogo otdeleniya (zav. B.I.Efros) dorozhnoy bol'nitsy g.Vil'nyus (nach. bol'nitsy Ya.A.Arenko)
(ESOPHAGUS, surg.
new method with Filatov's skin stalk)

BALYASOV, P.D., dotsent; EFROS, B.Ye., dotsent; LUNEV, A.N., kand. tekhn. nauk

About those who work and study. Tekst. prom. 24 no.8:1-4 Ag '64. (MIRA 17:10)

1. Prorektor Moskovskogo tekstil'nogo instituta (for Balyasov). 2. Dekan vechernego fakul'teta Moskovskogo tekstil'nogo instituta (for Efros). 3. Zamestitel' dekana po Pavlo-Posadskomu filialu Moskovskogo tekstil'nogo instituta (for Lunev).

EFROS, B. YE.

ZOTIKOV, V. YE.: YEFROS, B. YE.

Technology

Evening meeting of engineers with students and teachers of the institute. Tekst. prom. 12 No. 7 1952.

9. Monthly List of Russian Accessions, Library of Congress, October 1952. Unclassified.

EFROS, B. Ye.

KONYUKOV, Pavel Mikhaylovich; SMELOVA, Nina Alekseyevna; EFROS, Boris Yefimovich; ASTASHEV, A.G., retsenzent; KOPELEVICH, Ye.I., red.; SELEZNEVA, T.V., tekhn.red.

[Atlas of cotton spining machinery] Atlas mashin khlopkopriadil'nogo proizvodstva. Moskva, Gos. nauchno-tekhn.izd-vo lit-ry po legkoi promyshl., 1957. 340 p. (MIRA 11:3)
(Cotton spinning)

EFROS, B.Ye.

PETROV, I.A., prof.; BALYASOV, P.D., dots.; EFROS, B.Ye., dots.

"Forging of specialists." Tekst. prom. 17 no.8:16-19 Ag '57.
(Textile industry--Study and teaching) (MIRA 10:9)

BALYASOV, P.D.; EFROS, B.Ye.

Fortieth anniversary of the Moscow Textile Institute. Izv.vys. ucheb.zav.; tekh.tekst.prom. no.6:139-144 '59.
(MIRA 13:4)

1. Moskovskiy tekstil'nyy institut.
(Moscow--Textile schools)

BALYASOV, Pavel Dmitriyevich; KONYUKOV, Pavel Mikhaylovich; SMELOVA, Nina Alekseyevna; EFROS, Boris Yefimovich; ZOTIKOV, V.Ye., prof., retsenzent; ~~BARABANOV, L.G., retsenzent~~; KOPELEVICH, Ye.I., red.; VINOGRADOVA, G.A., tekhn. red.

[Laboratory manual on cotton spinning]Laboratornyi praktikum po priadeniiu khlopka. Izd.2., perer. i dop. Moskva, Izd-vo nauchno-tekhn.lit-ry RSFSR "Rostekhizdat," 1962. 491 p. (MIRA 15:9)

(Cotton spinning) (Cotton machinery)

BALYASOV, P.D.; BUDNIKOV, V.I., prof.; VANCHIKOV, A.N.; VLADIMIROV, B.M.; KISELEV, A.K.; KONYUKOV, P.M.; RAKOV, A.P.; SMELOVA, N.A.; EFROS, B.Ye.; ZOTIKOV, V.Ye., retsenzent; BELITSIN, N.M., retsenzent; KOSTIN, B.V., retsenzent; TERYUSHNOV, A.V., prof., red.; SOKOLOVA, V.Ye., red.; BATYREVA, G.G., tekhn. red.

[Cotton spinning] Priadenie khlopka. [By] P.D.Baliasov i dr. Pod red. V.I.Budnikova, A.P.Rakova, A.V.Teriushnova. Moskva, Rostekhizdat. Pt.2. 1963. 395 p. (MIRA 16:6)
(Cotton spinning)

BALYASOV, P.D.; BUDNIKOV, V.I., prof.; VANCHIKOV, A.N.; VLADIMIROV, B.M.; KISELEV, A.K.; KONYUKOV, P.M.; RAKOV, A.P., prof.; SMELOVA, N.A.; EFROS, B.Ye.; ZOTIKOV, V.Ye., retsenzent; BELITSIN, N.M., retsenzent; KOSTIN, B.V., retsenzent; TERYUSHNOV, A.V., prof., red.; SOKOLOVA, V.Ye., red.; BATYREVA, G.G., tekhn. red.

[Cotton spinning] Priadenie khlopka. [By] P.D.Baliasov i dr. Moskva, Rostekhizdat. Pt.1. 1962. 433 p. (MIRA 16:9)

(Cotton spinning)

KOFMAN, David Markovichdots.; TROFIMOV, Ivan Romanovich; TRUYEVTSEV, N.N., inzh.; EFROS, B.Ye., red.; YEMEL'YANOVA, T.M., red.; ZOLOTAREVA, I.Z., tekhn. red.

[Carding machines for cotton manufacture; their design, maintenance, repair and operation] Chesal'nye mashiny khlopkopriadil'nogo proizvodstva; ustroistvo, remont i obsluzhivanie. Moskva, Gizlegprom, 1963. 163 p. (MIRA 16:12)

(Carding machines)

KONYUKOV, P.M.; EFROS, B.Ye.

Use of reinforced viscose and nylon staple fibers in a mixture with cotton for the manufacture of high-number yarns for knit goods. Izv. vys. ucheb. zav.; tekh. tekst. prom. no.1:66-71 '64. (MIRA 17:5)

1. Moskovskiy tekstil'nyy institut.

KOBLYAKOV, A.I., dotsent, kand.tekhn.nauk; KONYUKOV, P.M., dotsent, kand. tekhn.nauk; EFROS, B.Ye., dotsent, kand.tekhn.nauk

Production of fine yarns from a blend of staple nylon fibers with cotton. Tekst.prom. 24 no.1:11-15 Ja '64. (MIRA 17:3)

1. Moskovskiy tekstil'nyy institut.

KONYUKHOV, P.M., kand. tekhn. nauk, dotsent; EFROS, B.Ye., kand. tekhn. nauk, dotsent; KOBLYAKOV, A.I., kand. tekhn. nauk

Characteristics of yarn and knit goods manufactured from a cotton and lavsan blend. Tekst. prom. 25 no.4:10-14 Ap '65.

1. Moskovskiy tekstil'nyy institut.

BALYASOV, P.D., dotsent; EFROS, B.Ye., dotsent; ZERNITSKAYA, E.I.

Reviews and bibliography. Tekst. prom. 25 no.8:85-89 Ag '65. (MIRA 18:9)

1. Prorektor Moskovskogo teksil'nogo instituta (for Balyasov). 2. Dekan vechernego fakul'teta Moskovskogo tekstil'nogo instituta (for Efros). 3. Glavnyy bibliotekar' TSentral'noy nauchno-tekhnicheskoy biblioteki (for Zernitskaya).

EFROS, D. A. (DECEASED) 1963/2

c' 1961

MECHANICS- hydrodynamics
liquid gas, oil

see ILC

S/133/63/000/003/001/007
A054/A126

AUTHORS: Kalinnikov, Ye.S., Efros, D.I., Borodets, I.V.

TITLE: The application of synthetic slag to refining steel melted in 50--ton open-hearth furnaces

PERIODICAL: Stal', no. 3, 1963, 207 - 212

TEXT: The method was tested for Ос.Л (Os.L) axle steel, 40А (40A), 20Х2Н4А (20Kh2N4A), 20, 40Х (40Kh) and 20Х (20Kh) grades in a 50-ton basic open-hearth furnace. Besides the slag addition the conventional technology was modified in that the content of S and Mn was not controlled during melting; for reduction in the ladle 45-% ferrosilicon was used instead of the 75-% grade and less aluminum was added into the ladle for the Os.L, 40A and 20Kh2N4A grades, while for the remaining grades no aluminum was used at all. Ferrosilicon was fed on the ladle bottom, the ladle was then heated and synthetic slag amounting to 5% of the liquid metal with a temperature of at least 1,650°C was fed in. Pouring time 2 - 5 min, pouring height 3.5 - 1.0 m. These conditions ensure a thorough mixing of metal and slag in the ladle. The synthetic lime-aluminoferrous slag

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The application of synthetic slag to ....

S/133/63/000/003/001/007
A054/A126

was melted in a 5-ton arc furnace (at 2,800 kw transformer capacity). The composition of the synthetic slag and its changes during melting the above-mentioned grades are given in a table. Samples from the ladle contained 0.014% S as against 0.025 - 0.039% in the conventional process. The burning out of silicon was also reduced from 19.3 and 15.1 to 14.3 and 10.5% (for the Os.L and 40A grades, respectively). Synthetic slag refining promotes reduction: for the Os.L grade samples, usually containing in forged condition 0.002 - 0.006% O_2, the oxygen content was found to be between 0.002 and 0.004%. The macrostructure of the test steels proved flawless and their content of nonmetallic inclusions decreased. The new method does not deteriorate the mechanical characteristics of the test steel; it improves their notch toughness, the a_k-value in transverse specimens increases, for instance, for the Os.L grade from 3.4 to 4.4, for the 40A grade from 3.8 to 5.6 - 5.7 kg/cm^2 and the anisotropy of the structure as to notch toughness is diminished by 30 - 55%. The investigations for the new method were carried out in cooperation with S.G. Voinov, S.I. Yaburov, L.F. Kosoy, A.G. Shalimov, P.A. Serov, T.A. Izmanova, Ya.M. Bokshitskiy, S.I. Kazarin, V.G. Kuklev, A.M. Mamlin, A.I. Lyutov, B.Kh. Vishawnik, P.I. Yegorov, N.M. Tarasov, et al. There are 8 figures and 2 tables.

Card 2/2

ZHURAVLEV, P.Ya.; EFROS, D.I.; KUTENKO, Yu.V.; POKROVSKIY, V.A.; GRANAT, I.Ya.; MOROZENSKIY, L.I.; GORSKIY, V.B.

Influence of vacuum treatment and the conditions of steel deoxidation on the formation of surface defects in continuous ingots. Stal' 25 no.10:891-894 O '65. (MIRA 18:11)

1. Gor'kovskiy mashinostroitel'nyy zavod.

EFROS, D. L.

"Hydrodynamic Theory of Plane-Parallel Cavitational Flow," Doklady Akademii Nauk SSSR, Vol 51, No 4, 1946 (263-269).
(Meteorologiya i Gidrologiya, No 6 Nov/Dec 1947)

SO: U-3218, 3 Apr 1953

AL', G.A

SHEYNBERG, S.I.,; KOZINA, M.G.,; NAGAYEVA, L.I.,; EFROS, G.A.

Improvement in the design of vascular suturing apparatus. Med. prom. 10 no.1:30-34 Ja-Mr '56. (MIRA 9:6)

1. Nauchno-issledovatel'skiy institut eksperimental'noy khirurgicheskoy apparatury i instrumentov.
(SURGICAL INSTRUMENTS AND APPARATUS)

VAYNRIB, Ye.A.; EFROS, G.A.; FRID, Ye.A.

Some problems in the mechanical heart theory. Med.prom. 10 no.2: 14-19 Ap-Je '56. (MLRA 9:8)

1. Nauchno-issledovatel'skiy institut eksperimental'noy khirurgicheskoy apparatury i instrumentov.
(PERFUSION PUMP)
(BLOOD--CIRCULATION)

VAYNRIB, Ye.A.; EFROS, G.A.; FRID, Ye.A.

Some problems in the theory of the mechanical heart. Med.prom. 10 no.3:32-33 Jl-S '56. (MLRA 9:11)

1. Nauchno-issledovatel'skiy institut eksperimental'noy khirurgicheskoy apparatury i instrumentov.

(PERFUSION PUMP)

EFROS, G. M.

Dissertation: "Technology and Properties of Pumice Slag." Cand Tech Sci, Sci Res Inst of Construction Engineering, Moscow 1953.

W-30928

SO: Referativnyy Zhurnal, No. 5, Dec 1953, Moscow, AN USSR (N-[illegible]

1. EFROS, G. M.

2. USSR (600)

4. Stone Industry

7. "Stone work." I. G. Galkin. Eng. A. V. Chepyzhenko. Reviewed by G. M. Efros, Stroi. prom., 31, No. 4, 1953.

9. Monthly List of Russian Accessions, Library of Congress, April, 1953, Uncl.

EFROS, G.M.

Distr: 4E2c

Simplified method for making expanded slag. L. B. Glik and G. M. Efros. *Stroitel. Prom.* 36, No. 6, 35-7 (1958).—Blowing air into slag held in a mold for 15 min. to 2.5 hrs. results in expanded slag of the same porosity and strength, indicating the lack of need for longer blowing. The temp. of a 0.5-m. slag layer drops to 600-800° after 15-20-min. blowing. Slag can be expanded directly at the blast furnaces by tapping it into containers provided with blowing facilities. I. D. Gat

3

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RM

GLIK, L.B.; EFROS, G.M., kand. tekhn. nauk

Lightweight aggregate made of fused primary furnace slags. Stroi. mat. 5 no.4:6-7 Ap '59. (MIRA 12:6)

1. Glavnyy inzhener tresta Tulmetallurguglestroy (for Glik). (Tula Province--Slag)

GLIK, Lev Bentsionovich, dots.; EFROS, Grigoriy Matveyevich, kand. tekhn. nauk; POPOV, Ni[redacted], zasl. deyatel' nauki i tekhniki, doktor tekhn. nauk, prof.; TYLKIN, M.N., red.; PULIN, L.I., tekhn. red.

[Foamed slag; its production and use] Shlakovaia pemza; proizvodstvo i primenenie. Pod-red. N.A.Popova. Tula, Tul'skoe knizhnoe izd-vo, 1962. 262 p. (MIRA 16:8)

1. Deystvitel'nyy chlen Akademii stroitel'stva i arkhitektury SSSR (for Popov).

(Slag)

EFROS I. A.

89-3-13/30

AUTHORS: Ziv, D. M., Efros, I. A.

TITLE: The Effect of α-Activity on the Corrosion Rate of Platinum and Zirconium in Hydrobromic Acid (Vliyaniye α-aktivnosti na skorost' korrozii platiny tsirkoniya v bromistovodorodnoy kisloto)

PERIODICAL: Atomnaya Energiya, 1958, Vol. 4, Nr 3, pp. 293 - 294 (USSR)

ABSTRACT: The corrosion factor $K(g/m^2.h)$ of 99,9 % pure platinum and zirconium was determined in the case of their being washed with a 47 % HBr. Po-210 (from 0,3 to 1 C/ml) was added to the acid.
The following results were obtained:
1) The addition of considerable α-activities at room temperature does not lead to an increase of the corrosion rate of platinum.
2) At 80°C and an activity of 0,3 C/ml only a minor increase of the corrosion rate of platinum occurs. The corrosion proceeds fastest according to the following order: the sample is completely immersed in the corrosive agent; it is immersed

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The Effect of α-Activity on the Corrosion Rate of Platinum and Zirconium in Hydrobromic Acid 89-3-13/30

only partly in the vapor of the corrosive agent.
3) When an α-activity of from 0,25 - 0,3 C/ml is present the corrosion rate of zirconium increases about 100 times.
4) Solid zirconium cubes corrode practically like zirconium foils. There are 2 tables, and 4 references, 2 of which are Slavic.

SUBMITTED: September 5, 1957

AVAILABLE: Library of Congress

1. Platinum-Corrosion factor-Determination 2. Zirconium-Corrosion factor-Determination

Card 2/2

EFROS, I. A.

09-4-5-11/26

AUTHORS: Ziv, D. M., Sinitsyna, G. S., Efros, I. A., Volkova, Ye. A.

TITLE: Method of Preparing Stable α-, β-, and γ-Radio-active Sources by Use of Inorganic Enamels (Metod izgotovleniya ustoychivykh α-, β-i γ-radioaktivnykh istochnikov na osnove neorganicheskikh emaley)

PERIODICAL: Atomnaya Energiya, 1958, Vol 4, Nr 5, pp 469 - 470 (USSR)

ABSTRACT: The inorganic enamel is used as an adhesive as well as a protective substance. Thereby an insensibility of the preparations, for instance, against humidity, changes of temperature etc. is attained. Gold foil served as a base for the preparing of radium preparations. The following composition of enamels were used:

SiO_2 - 34%

PbO - 30%

Na_2O - 3%

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89-4-5-11/26

Method of Preparing Stable α-, β-, and γ-Radio-active Sources by Use of Inorganic Enamels

BaO - 30%
B_2O_3 - 3%

The radium was added to the enamel as radium-oxide. The procedure of the preparing of the preparations is described with all particulars and is characterized by four sections:
1. Preparing of a titrated enamel suspension.
2. Preliminary enameling of the base.
3. Appliance of the radio-active preparations to the first enamel-base.
4. Appliance of a protective film of enamel.

There are 1 table and 6 references, none of which are Soviet.

SUBMITTED: January 15, 1958

AVAILABLE: Library of Congress

Card 2/2

1. Alpha rays—Sources 2. Beta rays—Sources 3. Gamma rays—Sources 4. Radioactive substances—Handling 5. Enamel coatings—Applications

ZIV, D.M.; EFROS, I.A.

Determination of the solubility of polonium hydroxide. Radiokhimiia 1 no.3:290-294 '59. (MIRA 12:10)
(Polonium hydroxide)

COUNTRY : GDR 3-7
CATEGORY :

ABS. JOUR. : RZKhim., No. 21 1959, No. 74175

AUTHOR : Ziv, D. M., Sinicyna, G. S., Efros, I. A., and*
INST. : Not given
TITLE : A Method for the Preparation of Stable Alpha, Beta, and Gamma-Emitting Sources Based on Inorganic Enamels

ORIG. PUB. : Kernenergie, 2, No 3, 295-296 (1959)

ABSTRACT : A translation. See RZhKhim, 1958, No 22, 73186.

CARD: 1/1 *Volkova, Ye. A.

EFROS, I.D.; LANTRATOV, M.F.

Decomposition voltage of potassium fluotantalate in fused salt solutions. Zhur. prikl. khim. 36 no.12:2659-2666 D'63.
(MIRA 17:2)

EFROS, I.D.; LANTRATOV, M.F.

Fusibility of the region rich in potassium fluoride of the system KF - TaF_5. Zhur. prikl. khim. 37 no.11:2521-2523 N'64

(MIRA 18:1)

POPUGAYEV,D.M.; EFROS,IN.N

[redacted]

Construction and operation of the Onega Hydrolysis Plant. Gidroliz. i lesokhim. prom. 8 no.3:28-29 '55. (MLRA 8:9)

1. Onezhskiy gidrolisnyy zavod
(Onega--Hydrolysis)

EFROS, I.N.; KOSHEVA, A.M., glavnyykhimik zavoda.

Increasing alcohol yield from hydrolysing digesters. Gidrolis. i lesokhim.prom. 8 no.5:17 '55. (MLRA 9:1)

1.Nachal'nik spirtovo tsekha Onezhskogo gidrolisnogo zavoda (for Efros). (Wood alcohol)

KOROL'KOV, I.I.; KRESTAN, E.Sh.; PAPASHNIKOV, L.M.; PARAMONOVA, G.D.;
EFROS, I.M.

Hydrolysis with co-ordinated reaction parameters and the re urn of the tail hydrolyzate to charge. Gidroliz. i lesokhim.prom. 11 no.7:20-24 '58. (MIRA 11:11)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut gidroliznoy i sul'fitno-spirtovoy promyshlennosti (for all except Efros). 2. Segezhskiy gidroliznyy zavod (for Efros)
(Hydrolysis)

KOROL'KOV, I.I.; KAL'MANOVICH, S.L.; VITEL'S, V.L.; ~~EFROS, I.N.~~

Introducing automatic control for the stabilization of hydrolysis processes. Gidroliz.i lesokhim.prom. 13 no.4: 11-14 '60. (MIRA 13:7)

1. Nauchno-issledovatel'skiy institut gidroliznoy i sul'fitno-spirtovoy promyshlennosti (for Kal'manovich). 2. Segezhskiy gidroliznyy zavod (for Efros).
(Segezha--Hydrolysis) (Automatic control)